cold wave, crossed the United States from the 24th to the 29th. The weather maps showing the progress of this storm are of special interest and will be found on Charts XIII-XV.

At 8 a. m. of the 24th the storm center was near Roseburg, Oreg., with a central pressure of 29.42 inches. It then moved rapidly due east and at 8 p. m., was over southern Idaho, with a barometer reading of 29.56 inches, an area of high pressure having in the meantime advanced over Alberta. At 8 a. m. of the 25th the storm was central near Denver, Colo., with a pressure of 29.54 inches, and the northern high-pressure area had increased in intensity and moved southward over northern Montana, where for the next few days it remained nearly stationary while increasing in intensity. Barometric conditions were favorable for a sharp fall in temperature to the north and west of the storm center, and frost, in some places heavy, occurred in the central valleys of California, while western Montana experienced a cold wave with temperatures of zero or below.

During the 25th, the storm center moved in a south-southeasterly direction to the panhandle of Texas with pressure of 29.60 inches, and the cold wave covered Montana, eastern Wyoming, and western South Dakota. Continuing a south-southeasterly movement, the storm center reached central Texas by 8 a. m. of the 26th. The cold wave had advanced over South Dakota and western Nebraska, and had extended over Wyoming, northern Nevada, and southern Idaho, the line of zero temperature reaching the southern boundary of Wyoming. During the 26th the storm reached the most southerly point of its path, and recurved, changing the direction of its motion from south-southeast to north-northeast, while it increased in intensity and in rapidity of motion. At 1 p. m. it was central over southwestern Arkansas, and at 6 p. m. was near Little Rock, Ark. At 8 p. m. it was over southeastern Missouri with a barometer of 29.56 inches. Rain fell throughout the Mississippi Valley, and was particularly heavy in its southern portion. The cold wave had advanced as far south as Taylor, Tex., and Roswell, N. Mex., and covered Nebraska, Kansas, Oklahoma, the eastern portions of Colorado, New Mexico, the Dakotas, and eastern and central Texas. During the night of the 26-27th, the storm center continued its north-northeastward movement, increasing in intensity, and by the morning of the 27th had reached northern Illinois, with a barometric pressure of 29.24 inches. Heavy rains were general throughout the Mississippi and Ohio valleys, and rain and snow fell quite heavily in the Lake region. These were the first heavy rains that had occurred in the Mississippi Valley for several months, and were much needed. In the rear of the storm, the cold wave extended from North Dakota to the Texas coast, and from the Rocky Mountains to the Mississippi River, the greatest twenty-four hour temperature fall, from 60° to 6°, occurring at Springfield, Mo. Temperatures of zero or lower were recorded as far south as Concordia, Kans., and Pueblo, Colo., and a minimum of 36° below zero occurred at Williston, N. Dak.

During the 27th the storm moved in a northeasterly direction over northern Illinois and southern Lake Michigan. The center was near Chicago, Ill., at 1 p. m., and at 8 p. m. was over southern Lake Michigan. Milwaukee, Wis., recorded the unusually low barometer reading of 28.84 inches. High winds were experienced at all Lake stations and throughout the Ohio and upper Mississippi valleys, Chicago recording a wind velocity of 72 miles an hour from the southwest. The high winds caused much damage to property along the Lake shores, houses were unroofed, and telegraph and telephone lines suffered severely. Telegraphic communication was entirely cut off over the Lake region and the Ohio and upper Mississippi valleys for twenty-four hours, and several days elapsed before the lines could be put into good working order. The heavy snow that accompanied this storm in many sections blocked trains and street cars. The cold wave covered the Mississippi Valley from Minnesota to Louisiana and extended to the Texas coast.

During the night of the 27–28th, high winds continued over the Lakes, while the storm center was passing over the Michigan Peninsula and Lake Huron. At 8 a. m. of the 28th it was near Rockliffe, Ont.; a secondary center had developed over the Atlantic coast near Long Island, and high winds were reported from all coast stations. Several vessels were wrecked near Hatteras, N. C. The cold wave extended from the Mississippi Valley nearly to the Atlantic coast, the line of zero temperature reached as far south as Keokuk, Iowa, and freezing temperatures were reported from all Gulf stations except in southern Florida and extreme southern Texas. During the day the storm center passed down the St. Lawrence Valley and high winds with snow continued on the New England coast and in the lower Lake region. The cold wave covered the lower Lake region and the middle and south Atlantic coast, but no very low temperatures were recorded in those districts. On the 29th the storm passed off to sea, colder weather followed in the Atlantic coast States, and the cold wave reached central Florida, with killing frost at Jacksonville and Tampa and a temperature of 38° at Jupiter.

SOME RELATIONS BETWEEN DIRECTION AND VELOCITY OF MOVEMENTS AND PRESSURE AT THE CENTER OF ELLIPSOIDAL CYCLONES.

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Loomis in his "Contribution to Meteorology," Chapter I, on areas of low pressure, tried to find out the causes that produce the different velocities of progression of lows. He selected for that purpose those lows moving more than 1000 miles and less than 240 miles in twenty-four hours whose pressure at the center changed very little (.02 inch) or not at all during the twenty-four hours considered. He tabulated rain, wind, pressure of the following high, and changes of pressure in twenty-four hours at the first station and also at the second station; the first station being the location of the low when first observed, the second station its location twenty-four hours later. One of the results of this investigation was to show that the rate of progress of low pressure areas is proportional to the changes of pressure on the first and second stations. Whether the lows that he compared exhibited any similarity, such, for instance, as similar forms of isobars, or whether they were primary or secondary, Loomis does not mention.

In this paper I have taken for investigation the opposite case; leaving the changes of pressure at the first and second stations out of consideration, I tried to find out whether there are any relations between the rate of progress and the change of pressure in the center of the respective lows, and how far it depends upon the azimuth toward which the low moves. I selected for that purpose, from the semidaily manuscript weather maps of the Forecast Division of the Weather Bureau, cyclones of different velocities, ranging from 50 to 900 miles in twelve hours, having at least two well shaped, closed isobars, ellipsoidal or circular (of 0.100 inch of difference). These lows are, of course, not strictly comparable in all respects, as they are of different dimensions, gradients, and ratios of axes, ranging from big circular lows extending from the Rockies to the Atlantic Ocean and from the Gulf up to the Lakes, on the one hand, to lows of long oval isobars on the other: but all are comparable in one respect; they are all primary. Their total number for the period 1893–1902 for five months, November to March, inclusive, amounts to 288. A list of all these, classified according to direction of movement, with a subclassification by months of occurrence, is given in Table 1. For instance (under east-northeast, December), will be found XIII, (November) 2p.01, referring to the cyclone track No. XIII, from 8 p. m. on the 2d of December, 1901, to 8 a. m.

on the 3d; "November" is inserted in parentheses because this length of track is shown on the November chart. I have chosen this group of five winter months because it is during these that the "southern circuit" track occurs. The lows were classified according to the trend of their movement into N., NNE., NE., ENE., E., ESE., SE., and SSE., and also according to the length of track in twelve hours. The distribution of velocities in miles is given in Table 2 for intervals of 50-150, 150-250, etc., and also separately for 0-100, 100-200, etc. I have done this because it was found that the 288 cyclones were not sufficient to give consistently the average values of pressures or pressure changes for each class of cyclones of different velocities. I have, therefore, used smoothed values of these quantities as shown in Tables 3 and 4, which were both calculated by the formula $\frac{a+2b+c}{\alpha+2\beta+\gamma}$, where, in Table 3, b is the sum of the pressures of all cyclones in the class considered, and a and c are the sums of pressures in the preceding and following classes, respectively. α, β, and γ are the numbers of cyclones in these three classes, respectively. For example, the value 29.177 inches, given in Table 3 for cyclones moving toward the north with velocities of 100 to 200 miles in twelve hours, is obtained by adding the pressures of all cyclones in the classes 50-150 miles and 150-250 miles to twice the sum of the pressures of cyclones in class 100-200 miles, and dividing the total by $21 = (1 + 2\times 7 + 6)$. A similar method was used in computing Table 4. In order to compute the above-mentioned averages the data were read off from the daily map and tabulated as follows:

(1) Pressure at the center of the low at the first location (8 a. m. or 8 p. m.).

(2) Pressure at the center of the low at the second location twelve hours later (8 p. m. or 8 a. m.).

(3) The length of the track between these two locations, for which length I shall use the word "velocity." Weight is to be given only to the averages for the four azimuths, NNE., NE., ENE., E., with velocities 300-600 miles. From the general trend of the data within these limits we may infer the probable results outside of these limits where the data are not sufficiently numerous to give reliable averages.

I do not wish to place much weight on the absolute values of the pressures and pressure changes; they should be considered merely as relative numbers showing how these elements change for each azimuth and for different velocities.

Having thus computed the smoothed averages of pressure and pressure changes for each azimuth, I added in the last column of Tables 3 and 4 the true general averages. These are not computed from the preceding columns, but represent the sums of all cases for the given range of velocities divided by the number of cases. Many of these numbers in Tables 3 and 4, especially for the extreme velocities, are inclosed in parentheses, either because they are not an average but simply the only case that occurred, or because the average does not conform to the general series of numbers, being too high or too low on account of some one extraordinary case entering into it.

The discussion of these Tables 3 and 4 is the subject of this paper. I have also presented them in diagrams on fig. 1 as "pressure-velocity curves" and "pressure-change-velocity curves." These curves give the pressure or change of pressure as a function of velocity of lows for each azimuth of motion. These are smoothed curves and show the general trend of direction for the smoothed numbers given in Tables 3 and 4. (We must consider the ESE., pressure curve a very rough approximation.) I have also added as a heavy black line the average curve, drawn to accord with the numbers given in the last columns of these tables.

The results drawn from these two sets of curves are as follows:

(1) The pressure curves ascend with each increase of velocity, that is to say, on the average the lows moving with greater velocity have greater pressure (absolute sea level) at the center and vice versa.

(2) Though much alike, the angles made with the velocity axis by the tangents to the pressure curves are not the same for different azimuths of movement. If we count these azimuths clockwise from north eastward, we see that the gradient $\Delta B : \Delta v$ (ratio of increase of pressure to increase of velocity) decreases as we go from N., curve over to NNE., NE., and ENE., but increases again when we pass over to the curves with southerly component of direction, or ESE., SE., SSE.

(3) The pressure change curves generally pass from positive to negative changes as velocity increases. They give the average change in pressure in twelve hours for cyclones moving in each different azimuth and velocity. These curves show average dips that decrease as the azimuth changes from N., to NNE., NE., ENE., and E., increasing afterwards, so that the greatest dip is for the curves of N. and SE. direction.

(4) The pressure-change curves for different azimuths do not all cross the line of zero change at the same point, but with each change of azimuth from north through east to south-southeast the crossing shifts toward greater velocities.

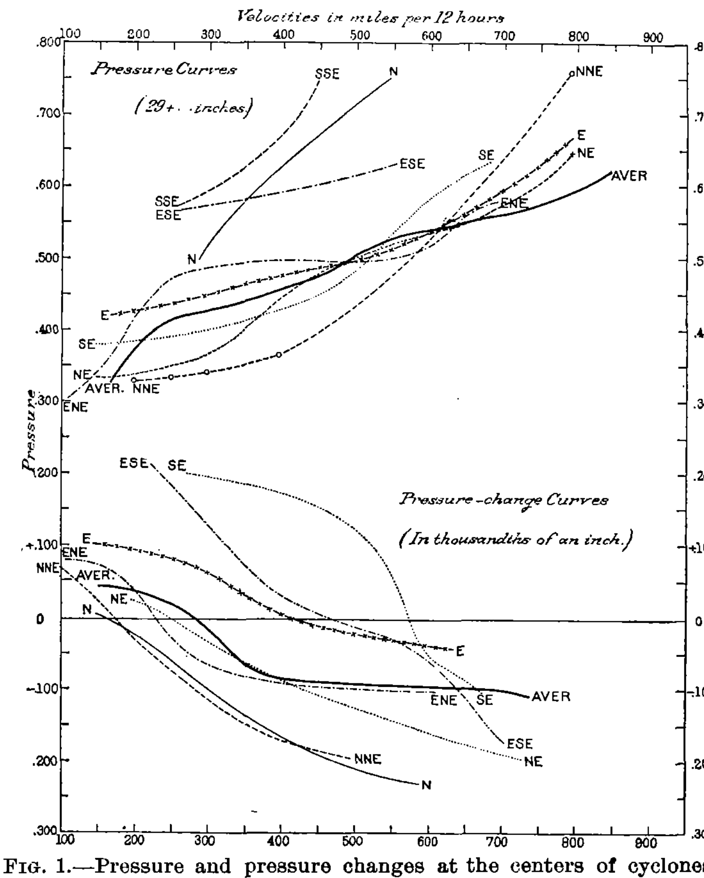

FIG. 1.—Pressure and pressure changes at the centers of cyclones of different directions and velocities of progression.

The logical explanation of these points I would give as follows:

Section 2 seems to me to indicate the influence of upper westerly drift on the movements of lows. If we look over the curves for the velocities of 300 to 600 miles in twelve hours, we see that the ENE. curve runs pretty nearly parallel to the velocity axis (the axis of abscissas) showing only a very slight increase of pressure for the higher velocities.

If we go over to the next adjacent azimuth in either direction, toward the north or toward the south, this increase becomes larger, which means that lows of various velocities that go over the American Continent with the prevailing westerlies and move toward the ENE. and E. do not show so great a range of pressure at the center as do those lows whose azimuths of direction form a greater angle with the prevailing westerlies.

Section 3 shows that the pressure-change curves decrease their dip as the azimuth increases (from north to east clockwise) increasing in dip afterward, and the point of zero change shifts continuously toward higher velocities with increasing azimuth. These curves, as mentioned above, give the changes of pressure that the lows experience when progressing in different directions and at different velocities in twelve hours.

But we see that for a low moving with a given velocity the amount of increase or decrease of the pressure, and so also of the velocity itself, depends on the azimuth in which it moves, or, in other words, it depends on its relation to that velocity which corresponds to the zero crossing of the respective azimuth.

Let us for instance consider a low moving at the rate of 350 miles in twelve hours and in any of the azimuths here considered.

With lows moving toward the N., NNE., NE., ENE., there would be reduction of pressure in the center, as we see from the pressure-change curves. The greatest or most rapid fall would be for those with northerly component of direction, the smallest for the east-northeasterly. This means that the northward moving low would experience the greatest reduction in velocity of progression. This great reduction of pressure would cause steep gradients, and the drawing of the air from all sides would give a good opportunity for the development of larger circular cyclones than in any other azimuth, especially if an opposing high in the east (St. Lawrence high) stops for a short time or moves very slowly eastward. There are really a good many evidences that lows, even small in extent, which on their passage on the eastern path of the southern circuit were deflected toward the north by the St. Lawrence high, developed into big circular storms. Professor Garriott's "Storms of the Great Lakes" (W. B. No. 288, Bulletin K, 1903), gives many excellent examples of this.

Let us now consider a low moving toward the E., ESE., or SE. at a velocity of 350 miles in twelve hours. All the corresponding pressure-change curves show that there is a tendency toward increase of pressure at the center, and that this is greatest in the case of a low moving toward the southeast, and parallel with the increase of pressure there is also, as the pressure curves show, an increase in the velocity of progression. This is the reason why, for instance, a big circular low in the proximity of the Great Lakes, if the retarding influence of the St. Lawrence high ceases, experiences an increase of pressure at the center on the way eastward, with decrease of energy, until the influence of its transition from land to sea becomes apparent.

If we consider lows of 500 miles we see that at that velocity lows moving eastward already decrease in pressure and velocity, while those moving toward the east-southeast would not increase in pressure and velocity so much as would the southeasterly, so after all it is apparent that the southeasterly moving lows are able to develop the greatest velocities, greater than lows moving in any other direction. In corroboration I wish to quote from my paper (MONTHLY WEATHER REVIEW, August, 1904, p. 363, and Chart XIII). I mention there high velocities over 60 miles per hour along the eastern Rocky Mountain slope. Now the explanation of high velocities along the Atlantic shore is obvious, since the lesser friction on the sea surface is an important factor. But how about these fast lows on the eastern slope of the Rockies moving with extremely great velocities in the southerly direction? Is that due to the fact that the American lows in comparison with the European have the steepest gradients usually on the western side?

Now we have seen from the preceding results and Section 1 that increase of pressure goes hand in hand with increase of velocity and vice versa. Hence the obvious explanation seems to me to be the following:

In cyclones we have to deal with the ascending currents in the front and descending in the rear. The pressure in the center may be considered as a balance between supply and discharge of the air due to these currents. If the pressure falls it means that less air is supplied in the rear than is discharged in the front. If the pressure rises it means an excess or increase of descending currents in the rear. These descending currents turn anticlockwise and flow into or feed the right side of the cyclone, increasing thus the winds and gradients in this portion, and therefore, according to Koeppen's law, increasing the whole progressive energy of the low in an easterly direction. Therefore increase of pressure in the center would correspond to increase of easterly velocity and vice versa, if there be no other causes that influence the velocities of the low.

The changes of pressure and velocity are corresponding, and as they oscillate up and down they work toward a steady condition of dynamic equilibrium or a certain velocity, which is different for different azimuths, and at which there would be no change of pressure at the center. This "certain velocity" is therefore that which we know under the term of "average" velocity, and this average velocity is different for each azimuth of movement. So if in Table 4, or fig. 1, we follow the line of zero change, we obtain for different azimuths the respective average velocities. We see that the average velocity increases with increasing azimuth. So, for instance, the average velocity as taken from the pressure-change curves for the lows going in a northerly direction is smallest being about 170 miles (in twelve hours), increases toward NNE. (about 180 miles), NE. (260 miles), ENE. (235 miles), E. 420 miles), ESE. (475 miles), and for SE. (if the four cases amount to anything) would be about 585 miles. So we see that cyclones traveling SE. would move in general with the greatest velocities.

If we take the average pressure-change curve, based on the data for all azimuths, we see that it crosses the line of zero change something below 300 miles (per twelve hours). From the data given in the MONTHLY WEATHER REVIEW (1893–1902) for the months here considered I have computed the average velocity to be 354 miles (per twelve hours). That is, the difference between the results obtained by these two methods is about 60 miles (in twelve hours). If we remember that this average (354 miles) includes also many secondary lows of various shapes, whose great velocities are hardly ever reached by the well-shaped ellipsoidal cyclones selected for consideration in this paper, we may say that there is a good coincidence between the data for "average" velocities obtained by these two quite different methods.

From this we see that we may now give our numerical term "average" velocity a more definite significance from a dynamic point of view; namely, it is the theoretical velocity of movement of a low at whose center the pressure neither increases nor decreases. This ideal case is, of course, hardly ever realized, especially if we have in mind the change of form of the low from day to day, the great influence of highs, and the influence of the physiographic features of the earth's surface, for instance in the transition from land to sea and vice versa.

The reader may have the impression that, in discussing the relation between velocities of movements of lows and pressure at their center, I have attempted to show that the former is the effect of the latter. This was not my intention, as the reverse may be the case, and it is also possible that both pressure and velocity may be the result of a third cause not considered in this paper. A discussion of this point would lead to a discussion of the theory of cyclones, whereas my purpose in the present paper is only to show the relation between pressures and velocities in well-shaped ellipsoidal primary cyclones.

TABLE 1.—*List of the cyclones studied.*

NORTH

November: I. 2a. 96.
December: VIII. 22p. 00; V. 15p. 02; VII. 10p. 99; V. 15a. 02.
January: XII. 29a. 00; VIII. 19p. 98.
February: VI. 27p. 02.
March: VII. 24a. 01; VI. 15a. 98; VI. 14p. 98; VI. 20a. 01.

NORTH-NORTHEAST.

November: IX. 21p. 98, XI. 27p. 93; VIII. 26a, 96; XII. 27a. 93; IX. 25p. 95.
December: V. 13p. 97; VIII. 23a. 00; VII. 11p. 99; V. 14p. 97.
January: VIII. 21p. 02; I. 1a. 93; II. 6a. 99.
February: VIII. 22a. 00; VIII. 20p. 00; VI. 28a. 02; III. 6a. 96; XII. 27a. 93; VIII. 26a. 99; I. 1p. 02.
March: VI. 19p. 01; VIII. 26a. 02; IV. 9p. 01; X. 28p. 99; IX. 27p. 98; V. 11a. 99; IX. 27a. 98.

NORTHEAST.

November: I. 1a. 97; 11. 4p. 97; VIII. 25p. 02; I. 2a. 97; X. 30p. 99; XIII. 25p. 00; IX. 21a. 98; X. 23a. 01; III. 5p. 02; II. 1p. 94; III. 10a. 96; XIII. 24a. 00; XII. 22a. 00; IV. 9p. 98; XI. 21a. 00.
December: V. 18p. 98; VI. 20p. 02; II. 3p. 98; V. 19a. 98; III. 9p. 01; VI, VII. 12a. 94; VI. 9a. 93; XII. 26a. 95; I. 3p. 99; V. 14a. 01; I. 2a. 02; I 2p. 93; XIV. 30a. 95; V. 14p. 02.
January: XV. 20p. 94; I. 3p. 97; IX. 21a. 95; IX. 22p. 98; IX. 22a. 98; VI. 11p. 93; X. 25p. 95; XIII. 30p. 01; II. 6a. 01; X. 24p. 98.
February: VII. 22a. 99; III. 17p. 02; III. 17a. 02; V. 26a. 02; XII. 27p. 93; VI. 17a. 93; V. 9p. 94; VI. 27a. 02; VI. 12a. 94; V. 9a. 94; VIII. 25p. 99; VII. 12p. 96; IV. 8p. 96; I 5a. 00; I 2p. 01; III. 5p. 96; III. 7p. 00; VI. 11a. 94; V. 12p. 00.
March: V. 15a. 02; II. 3a. 99; V. 13a. 01; V. 12a. 01; VI. 15p. 98; IX. 23a. 93; XII. 15a. 94; IV. 10a. 01; II. 5a. 99; III. 6a. 00; IV. 19p. 96; IV. 10p. 98; VII. 10p. 94; IV. 18p. 96; II. 4a. 99; X. 29a. 99; IV. 12a. 02; IV. 11a. 96; IX. 28a. 02; V. 12p. 98; X. 27p. 99.

EAST-NORTHEAST.

November: XIII. 26a. 00; IX. 22a. 98; X. 21p. 93; VI. 11p. 01; II. 5a. 97; I. 1p. 97; IV. 10p. 97; IV. 10a. 98; VIII. 25a. 02; VII. 19a. 95; III. 9a. 97; XII. 22p. 00; XII. 29p. 93; III. 11a. 96; I. 2p. 97; VII. 25p. 97.
December: V. 13a. 97; V. 18a. 98; X. (November) la. 99: VI. 21a. 02; I. 3a. 93; I. 2p. 02; II. 4p. 02; I. 2a. 95; II. 4a. 98; XIII. (November) 2p. 01; IX. 16p. 93; VIII. 27a. 01; IV. 12p. 02.
January: VIII. 22a. 02; XV. 20a. 94; VIII. 20a. 98; I. 1p. 93; IX. 20p. 95; IV. 11p. 01; VIII. 20a. 02; XI. 26p. 99; VII. 15a. 98; IV. 4p. 94; IV. 11a. 01; VII. 14p. 98; X. 24p. 99.
February: V. 25a. 02; VIII. 21p. 00; II. 4p. 98; VII. 21p. 99; I. 3a. 01; I. 4p. 00; VIII. 25a. 99; II. 5a. 98; I. 2p. 93; III. 9p. 93; IV. 9p. 96; XII. 28p. 00; VII. 13a. 96; II. 6a. 93; III. 9a. 93; IV. 14p. 93; III. 8p. 01.
March: IX. 13p. 94; VI. 12p. 93; VI. 19a. 01; IV. 8a. 93; VI. 19a. 96; VI. 13p. 93; V. 10p. 93; VI. 14p. 99; VII. 19p. 98; VII. 19a. 99; V. 14a. 97; VIII. 22p. 98; III. 7p. 02; IV. 4a. 95; IV. 12a. 97; IV. 12p. 02; VII. 17p. 99; II. 5a. 97; V. 13a. 98; VII. 25a. 01; VIII. 25p. 96.

EAST.

November: X. 22a. 93; III. 7a. 01; IV. 14a. 99; II. 5p. 97; X. 21a. 93; III. 6p. 01; XIV. 26p. 94; VI. 21a. 97; IX. 29p. 02.
December: VII. 24a. 02; VI. 20a. 02; IX. 16a. 93; III. 8a. 94; XI. 18p. 93; XII. 20p. 94; VI. 9p. 93; IX. 15p. 93; XII. 21a. 94; III. 7a. 95; I. 2a. 93; VII. 12a. 93; IX. 16p. 94; III. 8p. 00; X. 22a. 96.
January: X. 24p. 00; XI. 25p. 99; III. 10a. 01; VIII. 21a. 02; XI. 26a. 99; VI. 12a. 98; X. 25a. 98; IX. 21p. 01; VIII. 20.p. 02; VIII. 18a. 95; X. 25p. 98; VII. 15p. 98; V. 18p. 02; III. 8a. 99; IV. 8p, 98; III. 9p. 00.
February: XII. 28a. 00; VIII. 21a. 00; I. 3p. 00; I. 2a. 02; V. 15a. 98; XI. 23p. 93; IX. 6p. 95; I. 4a. 00.
March: V. 11a. 93; V. 12p. 01; IX. 29a. 02; VI. 13a. 93; IX. 13a. 94; XIII. 18p. 94; XIII. 19a. 94; IV. 13a. 02; VII. 11a. 94; III. 5p. 00; I. 4a. 01; V. 12a. 99; I. 9a. 00.

EAST-SOUTHEAST.

November: II. 9a. 99; VI. 12a. 01; IV. 11p. 97.
December: VI. 19p. 02; IV. 12p. 00; XV. 31p. 99.
January: XIII. 17p. 94; XIII. 24a. 93; VII. 13p. 93; V. 18a. 97; II. 6p. 01; I. 8a. 01; II. 7a. 01; I. 2a. 02; XII. 31a. 98; X 25a. 00.
February: XI. 23a. 93.
March: IV. 8p. 93; VIII. 23a. 98; III. 8p. 02; XV. 20a. 95.

SOUTHEAST.

November: X. 24a. 01; IV. 11a. 97.
December:
January: III. 6p. 98.
February:
March: XII. 15p. 94.

SOUTH-SOUTHEAST.

November:
December: II. 7a. 00; V. 11a. 95; V. 11p. 95.
January:
February: IX. 18p. 96; IX. 18a. 96.
March.

TABLE 2.—*Distribution of numbers of cyclones according to velocity and azimuth of movement.*

Velocity.	Azimuth.																Total.	
	N.		NNE.		NE.		ENE.		E.		ESE.		SE.		SSE.			
0-100	....	0	....	0	....	2 (3)	....	0	....	0	....	1	....	1	....	1	......	6
50-150	1	....	1	....	4 (5)	....	1	....	2	....	1	....	1	....	2	....	(14)	....
100-200	....	7	....	2	....	6 (7)	....	3	....	5	....	1	...	0	....	1	.....	26
150-250	6	....	3	....	7 (8)	....	4	....	5	....	1	....	0	....	0	....	(27)	....
200-300	....	0	....	6	....	10	....	10	....	5	....	1	....	1	....	0	......	33
250-350	0	....	4	....	12	....	13	....	10	....	2	....	1	....	2	....	(44)	....
300-400	....	2	....	4	....	12	....	8	....	9	....	1	....	0	....	3	......	39
350-450	2	....	8	....	12	....	11	....	7	....	0	....	0	....	1	....	(41)	....
400-500	....	0	....	7	....	11	....	10	....	9	....	1	....	0	....	0	......	38
450-550	1	....	6	....	15	...	13	....	8	....	7	....	1	....	0	....	(51)	....
500-600	....	2	...	3	....	20	....	22	....	15	....	8	....	1	....	0	......	71
550-650	1	....	1	....	16	....	20	....	20	....	4	....	1	....	0	...	(63)	....
600-700	....	0	....	2	....	8	....	16	....	11	....	5	....	1	....	0	......	43
650-750	1	....	2	....	6	....	13	....	4	....	5	....	0	....	0	....	(31)	....
700-800	....	1	....	1	....	4	....	10	....	4	....	2	....	0	....	0	......	22
750-850	0	....	1	....	5	....	5	....	4	....	0	....	0	...	0	....	(15)	....
800-900	....	0	....	1	....	4	....	1	....	3	....	1	....	0	....	0	......	16
850-950	0	....	0	....	0	....	1	....	1	....	0	....	0	....	0	....	(2)	....
	(12)	12	(26)	26	(79)	79	(80)	80	(61)	61	(21)	21	(4)	4	(5)	5	(288)	288

TABLE 3.—*Pressure in thousandths of an inch (in excess of 29 inches) in the first location.*

Velocity, miles in 12 hours.	Smoothed averages.								True general average.
	N.	NNE.	NE.	ENE.	E.	ESE.	SE.	SSE.	
	29. +	29. +	29. +	29. +	29. +	29. +	29. +	29. +	29. +
50-150	(204)	(565)	(428)	300	(466)	(326)	380	(776)	(487)
100-200	177	(490)	(357)	341	(438)	(210)	380	(830)	348
150-250	(164)	331	333	418	437	(270)	(280)	....	(299)
200-300	(157)	332	352	473	472	532	(280)	570	422
250-350	(580)	342	357	488	(421)	600	(280)	594	424
300-400	(580)	390	395	493	(425)	570	(280)	629	434
350-450	580	366	471	499	483	(640)	....	672	(500)
400-500	667	340	497	497	499	(675)	460	741	465
450-550	(795)	421	487	493	485	(643)	460	....	504
500-600	750	571	511	497	509	616	500	....	525
550-650	(705)	(684)	537	515	538	592	580	....	544
600-700	(430)	636	546	557	560	578	620	....	573
650-750	(200)	595	557	579	576	(558)	620	....	560
700-800	(200)	658	604	(540)	633	(549)	....	....	561
750-850	....	760	647	(478)	661	(546)	....	....	598
800-900	....	....	....	(434)	(636)	(520)	....	....	618
850-950	....	....	....	....	....	....	....	....	....

TABLE 4.—*Change of pressure in thousandths of an inch in twelve hours at the centers of cyclones moving toward different azimuths and with different velocities.*

Velocity.	Smoothed averages.								True general averages.	
	N.	NNE.	NE.	ENE.	E.	ESE.	SE.	SSE.		
50-150	(−020)	+070	+006 (−023)	+084	(+081)	(+103)	(+040)	(−064)	+004	......
100-200	+003	+005	+015 (−037)	+078	+103	+225	(+040)	(−025)	......	+034 (+052)
150-250	+014	−042	+016 (−022)	+041	+090	(+261)	+200	(+040)	+033 (+050)	......
200-300	+020	−055	+006 (−004)	−034	+064	+196	+200	+080	......	+006
250-350	−020	−085	−027	(−095)	+076	+130	+200	+080	−008	......
300-400	−140	−151	−084	(−110)	+053	+085	+200	+080	......	−063
350-450	−140	−170	−127	−068	−018	+010	......	+080	−091?	......
400-500	−166	−178	−142	−067	−014	+002	+140	+080	......	−100?
450-550	−220	−200	−109	(−109)	−003	+008	+140	......	−087?	......
500-600	−220	−222	−097	(−104)	−017	+014	+080	......	......	−070
550-650	−220	−258	−127	−074	−033	000	−040	......	−078	......
600-700	(−150)	−290	−170	(−045)	−041	−084	−100	......	......	−085
650-750	(−080)	(−272)	−194	(−053)	(−006)	−160	−100	......	−107	......
700-800	(−080)	(−250)	−199	−078	(+041)	−195	......	......	......	−105
750-850	......	(−275)	(−159)	−077	(+020)	(−113)	......	......	−084	......
800-900	......	−300	(−118)	(−063)	(−026)	(+060)	......	......	......	−072
850-950	......	−300	......	......	(−053)	......	......	......	......	......